

Exposed Wires: Trade Center Attack Shows Vulnerability Of Telecom Network --- Damage to Verizon Facility Snarled City's Phones; A Legacy of Monopoly? --- Lasers Across Hudson River

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Staff Reporters of The Wall Street Journal
2,618 words
19 October 2001
The Wall Street Journal
A1
English
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NEW YORK -- George Famulare, a 28-year veteran of New York's local phone company, was doing his expenses in one of the world's largest communications hubs on the morning of Sept. 11 when he heard a loud thud.

Initially, he was infuriated, thinking a renovator's scaffold had fallen off the landmark 1926 building at 140 West St., just feet away from the World Trade Center. Its 32 floors house the humming gray equipment boxes that carry nearly 30% of Lower Manhattan's phone and data traffic, capacity equal to that of Cincinnati.

Mr. Famulare, in charge of Verizon Communications Inc.'s buildings south of Midtown, saw people running away but implored employees to stay put. "We're safer in the building. The building is a tank."

The events of Sept. 11 would quickly prove otherwise. By the end of the day, Verizon's hub sustained the worst damage ever to the nation's communications network. Getting calls going again has proved to be the most significant challenge Verizon, the largest local phone company, has ever faced, and it is prompting a rethinking of the security of America's highly concentrated telecommunications systems in an age of terrorism.

The disaster also has sparked a new round of debate about telecom deregulation itself. Verizon executives have loudly criticized the rules that require them to rent parts of their networks -- and space in their central offices -- to competitors. They argue that the arrangement has discouraged rivals from building alternative networks by making it too cheap and easy to piggyback on the regional giants.

But competitors draw the opposite lesson, saying the catastrophe points to the danger of having one company in control of so much. "Verizon is the incumbent, and the wiring has been in the ground for forever and a day. They have not built a redundant network," says Tom Jones, director of Spectrotel Inc., a competing carrier based in New Jersey.

All across the country, towns and smaller cities rely on only one hub, meaning that they could lose touch completely if that hub were wiped out. In many larger cities, phone traffic is funneled into very concentrated routes in and out of town. And yet, as of Sept. 11, an industry-led federal committee that addresses phone reliability hadn't discussed terrorism contingency plans in at least a year and a half.

"This is now a whole new layer of preparedness that our industry and our country needs to be thinking about," says Ivan Seidenberg, Verizon's president and co-chief executive. "Whether we need antiaircraft missiles on the tops of buildings, I don't think so," he adds. "But I'm willing to put everything on the table."

Already, changes are being made. The federal government has asked the nation's wireless carriers to assign

priority to government agencies and emergency personnel in the event of another disaster. On Sept. 11, many rescue workers couldn't get calls through. AT&T Wireless Services Inc., which ran many of its switches through West Street, will now spread them throughout the city. Verizon is adding more backup capacity and alternate routes and has asked regulators to raise wholesale rates in New York to cover the expense.

Many businesses are taking the matter into their own hands. Merrill Lynch & Co. is conducting a global review of its communications providers to ensure the brokerage firm has multiple sources in each location. Phones in the firm's New York headquarters across from the Trade Center went out on Sept. 11, even though it split its local and long-distance service between Verizon and AT&T Corp., which lost a major switching hub in the Trade Center. The firm is even using a set of lasers to beam data across the Hudson River between locations in New York and New Jersey.

At the New York office of headhunting firm Spencer Stuart, where employees are still working from cellphones, officials are ordering different lines from different carriers that reach their office by different routes and hubs. "It's just something that wasn't worth the cost before the unthinkable happened," says Rick Abel, chief technology officer of the Chicago-based firm.

E Commerce Group Inc., which had more than 40 high-speed data lines disabled on West Street, is building a new facility in Charlotte, N.C., so the New York-based company can have "geographic diversity" to spread out its risk beyond backup offices it already maintains in New Jersey.

By nearly all accounts, New York City's phone network -- and the people who run it -- performed well under incredible stress. By the Friday after the attack, Verizon had moved the equivalent of 2.1 million voice and data lines around Lower Manhattan. Stringing fiber-optics through open trenches and windows, the company was able to restore the New York Stock Exchange less than a week after the assault. Verizon workers wearing respirators had to climb 23 flights of stairs in the dark to lug down servers to run the exchange's price-quotation system.

It was an impressive performance compared with what was once considered the nation's worst telecommunications disaster, a relatively limited fire inside a Chicago switching station on Mother's Day in 1988 that closed O'Hare Airport and wiped out service for 38,000 local customers for as long as a month. Since then, the industry has used technology and better planning to create far more reliable networks, focusing on adding backup circuits to fiber lines that seemed vulnerable to an errant backhoe or natural disaster. Most networks can now respond within milliseconds if a particular link is broken, rerouting traffic through hundreds of alternate links.

What the World Trade Center attack showed, however, is the vulnerability of the final, local link to phones and computers through the nation's telecom hubs, or "nodes," which act as collecting points for traffic. More than one month after the attacks, thousands of residents and businesses are without basic phone service.

"The weak point is the local exchange carrier," says Todd Tanner, president of the Tanner Group, a Salt Lake City firm that helps clients such as the Department of Defense and Walt Disney Co. build toll-free call centers. "If you knocked out the central office in downtown Salt Lake City, you'd not only take out the local office, but the switch that connects all the long-distance carriers to the people in Utah."

The New York City telecom system is itself a relic of historical quirks, with different systems built on top of one another, forming a kind of technology sediment. Manhole access to the telecom network is still managed entirely by the Empire City Subway Co., a subsidiary of Verizon that dates back to 1890. While maintaining hundreds of separate routes around the city, many competitors' lines still travel over the same paths laid down more than 100 years ago. Under the Sept. 11 wreckage, Verizon officials uncovered defunct wooden cable sheaths dated 1926.

Foolproofing the physical infrastructure against future terrorist attacks could require hundreds of billions of dollars of new investment. Some say it makes sense to spread out the nation's most densely concentrated hubs. Others look to switching methods used by the Internet, which was designed to withstand nuclear attacks, as a model.

But finding any consensus about what to do will be difficult. Verizon's Mr. Seidenberg says the terrorist attacks prove that only the biggest phone companies are up to the task of securing the nation's phone system, and says current regulations discourage the development of true, alternate networks. He defends Verizon's performance, pointing out that the company has 70 hubs in New York City and four besides West Street. In the financial district, which allowed the company to restore service to the New York Stock Exchange and crucial parts of the financial system in a matter of days. He remains concerned about security, though, and is now making plans to tighten it around the company's hubs. Among other things, Verizon is making plans to require background checks on employees of competitors who use Verizon's facilities.

Others say the extensive damage to Verizon's hub demonstrated that it is dangerous to rely on one company. They point out that only with the help of smaller competitors did parts of New York get their dial tones back.

"We have buildings that would have been waiting for Verizon to get the service up if there were not alternatives," says Agostino Cangemi, the New York City commissioner in charge of telecom franchising. Allegiance Telecom Inc. of Dallas provided service to some city agencies disconnected, while Time Warner Telecom Inc. is now operating thousands of lines through fiber it activated after the attack.

Such activities aside, Sept. 11 hammered home the fact that local phone business has essentially remained a monopoly. Dozens of long-distance networks crisscross the nation, but there is only one dominant local carrier in each city, leading to concentration in hubs such as West Street. Even competing telecom companies that build their own infrastructure mostly rely on connections provided by the regional phone companies in the same central offices. In a study for Amtrak by the Tanner Group, less than 10% of competitive local carriers were found to have facilities truly separate from the local Bell companies.

When it was built in 1926, 140 West St. sat in near-isolation among the markets, bars and luncheonettes along the Hudson River. Considered the first truly Art Deco skyscraper, the building is far more glamorous than most central offices that form the architecture of the phone system because it once served as headquarters for the New York Telephone Co. The French architect Le Corbusier so admired the 486-foot-tall building that he featured it in his famous work, "Toward a New Architecture."

At the time of its construction, phone companies were already replacing telephone operators with banks of electromechanical switches. Originally developed by a frustrated mortician whose calls were being diverted to a competitor by the rival's phone-operator wife, the switches of the time used motor-driven magnets traveling on thin vertical bars to connect the calls. A full panel office would cover about 6,000 square feet, and serve 10,000 lines.

Advances in electronics led to the development of mega-hubs such as West Street. By Sept. 11, racks of gently humming electronics were serving 4.5 million data circuits, along with 300,000 phone lines. Such concentration occurred across the nation: Between 1990 and 1999, the number of local Bell central offices inched up less than 1% to 9,968, while the number of phone lines increased 34%, according to the Federal Communications Commission.

Mr. Famulare and Verizon officials knew the concentration of West Street well. After crawling out of the building through a tunnel left by a chair when the first tower collapsed, Mr. Famulare came back twice to try and turn off all essential power to conserve energy. On his way back a third time, giant steel girders from the collapse of 7 World Trade Center, a 47-story building adjacent to the towers, crashed through the third-floor walls, falling all

the way to the second level of the hub's basement. Water from broken lines in the street and from fire hoses poured into the building, making it impossible to operate the generators and batteries that were supposed to run the equipment in the event of a power failure.

When the power ran out, the calls stopped getting through. By the next morning, "water was rushing down the stairs," recalls Paul Lacouture, head of Verizon's network. "It was like it was raining inside the building in a dust storm."

The damage was so great that Verizon has had to rebuild much of the subterranean network connecting southern Manhattan by rerouting lines through other hubs. Where its manholes weren't buried under the remains of the World Trade Center, workers used special industrial vacuum cleaners to suck out debris. The rerouting meant that thousands of data paths had to be redrawn, a task complicated by the fact that many large operations, such as major brokerages and the Big Board, have custom setups that had to be redone virtually from scratch.

The tentacles of West Street reached across the city. Nearly five weeks after the attack, municipal-bond brokerage Leberthal & Co. is still without 210 of its 225 phone lines, which were hooked into the West Street switching station two blocks from its office at 120 Broadway. "This is a phone business," says President Alexandra Leberthal. "I don't know how many of our clients are frustrated because they can't get in touch with us."

For now, the company is coping with a makeshift messaging system: All calls are now forwarded to a remote answering service, where operators send employees e-mails with the details of the call. Once a Leberthal employee receives the e-mail, he then rings the caller back on a cellular phone. "Because we've been sending so many e-mails back and forth, once a week, that whole system crashes," adds Ms. Leberthal. To compound matters, the building's cellular reception is poor, which has forced employees to cluster around the office windows, often leaning against the wall to help find a stronger cellular signal.

Even businesses far away from the damage were affected. Officials at the Limited Inc. were shocked to discover that the main circuit that delivered service to an office on 42nd Street came out of West Street. The phones at E Commerce Group, directly across from the Trade Center, somehow kept working because officials had ordered some copper links that had curiously been routed through a hub on 37th Street.

The damage to the West Street hub showed the delicate balance of the current system, in which changes in one location have unforeseen impacts on another. As large companies fled to new quarters around the city and nearby suburbs, the normal patterns of phone traffic in the New York area were disrupted, leading to congestion that left some callers hearing fast busy signals and recordings. After Lehman Brothers Inc. took over a Sheraton hotel in Midtown, its bankers quickly discovered that the phone system, engineered for tourist traffic, could only handle about 75 outgoing calls at a time.

Verizon still has 16,000 lines out of service, many of them in Chinatown, because the district's phone lines passed right under the Trade Center, where they remain buried and waterlogged. At Mott and Worth Streets, Verizon has opened gaping holes in the street, where crews working around the clock are installing the plastic sheaths that will soon house the new phone lines. Instead of opening just the tops of manholes, the company has dug what look like foxholes more than 10 feet long so it can fit more workers in at one time.

Back at West Street, Mr. Famulare is still working nearly constantly. A 60-foot plywood wall blocks off access to the rear of the building, where gigantic cranes are still excavating the remains of 7 World Trade Center and trying not to, in their jargon, "rub" West Street. Much of the building is now back in service, and Mr. Famulare speaks with evident pride as he looks at his old "tank" being restored to service. "We have resurrected it," he says.

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